Elk Hills Class I NH wells – Aquifer Exemption-Related Background information

There are three operating wells at Elk Hills. There were four originally, but one was P&A'd.

The EPA Class I UIC permit expired in February 2011. Elk Hills submitted a timely application for renewal. We issued a letter of administrative completeness for the renewal application, and then issued several rounds of technical review comments. We also issued an extension of the original permit keeping it valid until a renewal permit was issued.

As part of the technical review it was discovered that the injection wells (which inject Class I fluids into the Tulare Formation) are located outside the lateral and vertical boundaries of the Tulare Formation that was exempted under the MOA.

The Class I UIC permitted wells are located adjacent to the Buena Vista field as depicted in the DOGGR primacy application. Table 1 of the primacy application identified the non-hydrocarbon producing zones that were proposed to be exempted, and this included the Tulare Formation within the boundaries of the Buena Vista field. The disposal wells at Elk Hills are just outside the field boundary. Volume 1 depicts the hydrocarbon producing zones in the Buena Vista field (which are also exempt) and the Class I disposal wells are also adjacent and outside of these producing zones.

According to the "Salinity letter" dated March 1982, the TDS in the Tulare Formation in the in the Buena Vista field is 9,200 ppm. As a result, an exemption was granted in the MOA, however the Class I wells, as well as a number of Class II WD wells are located in the same section (Section 18) and all of these wells are injecting into non-exempt zones.

Documents Attached

l. Table 1 of MOA which lists the Tulare Formation in the Buena Vista Field as an exempt aquifer

2. Buena Vista field hydrocarbon pools – from Volume I DOGGR, Oil and Gas Fields of CA

3. Map that goes with Table 1 of the Primacy Application – depicts non-hydrocarbon zone historically used for disposal in Buena Vista field.

4. DOGGR Administrative Field boundaries map from DOGGR website

5. Excerpt from Response to Comments on the draft Elk Hills EPA Class I UIC permit – mistakenly says the formation is exempt.

6. From Elk Hills' renewal application - depicts Class II and Class I well locations.

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Attachment 2

Exempted 1425 Demonstration Aquifers

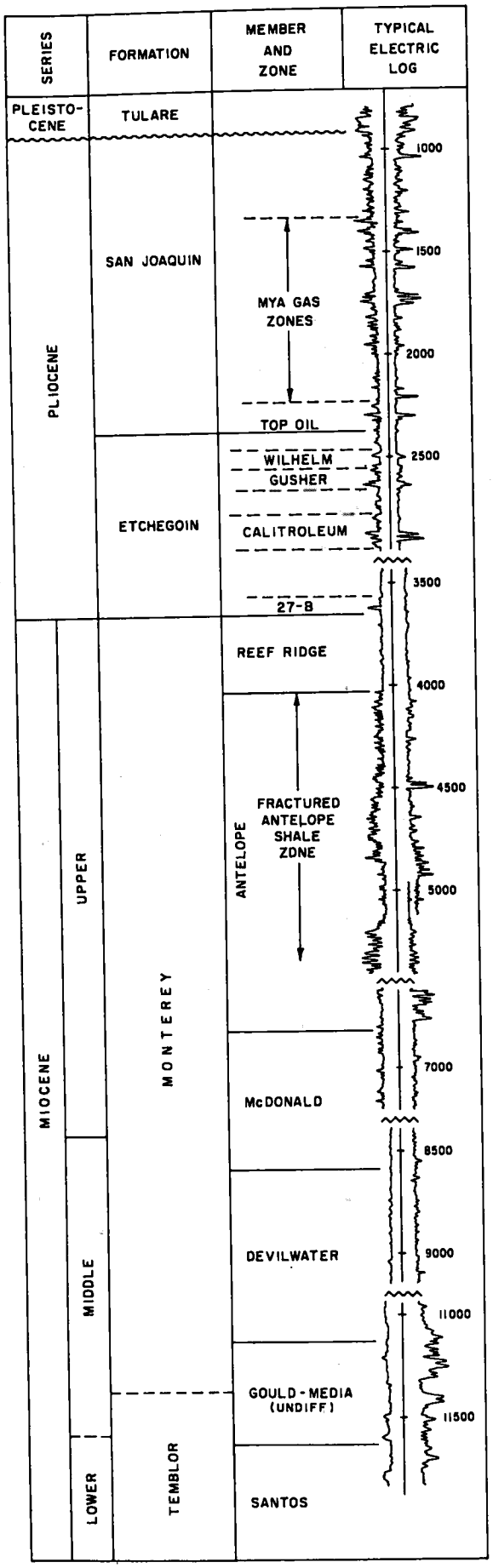
All oil and gas producing aquifers identified in Volumes I, II, and III of the California Oil and Gas Fields submitted in the 1425 Demonstration dated April 20, 1981 are exempted.

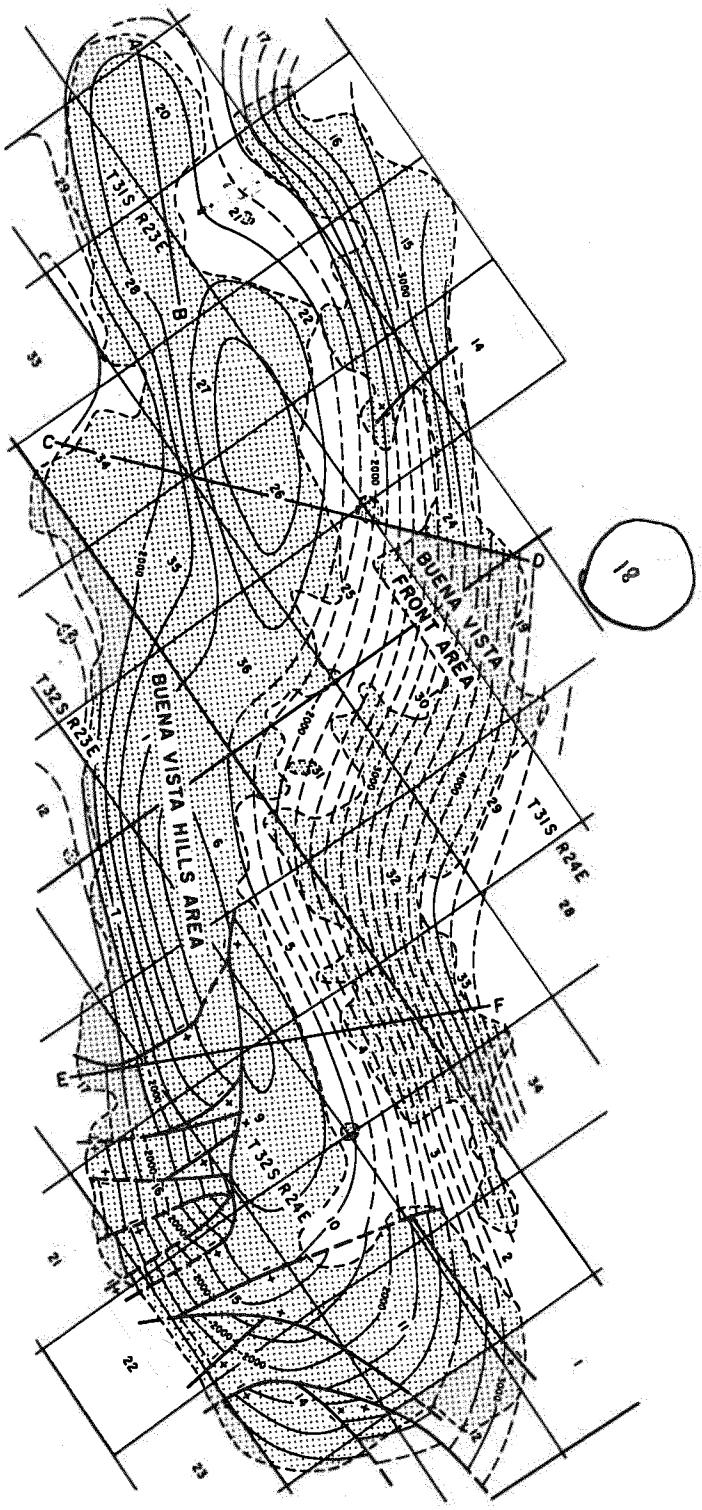
In addition, the following aquifers are also exempted.

DISTRICT	FIELD	FORMATION/ZONE
2	Ramona	Pico
2	Oat Mountain	Undiff.
2	Simi	Sespe
3	San Ardo	Santa Margarita
3	San Ardo	Monterey "D" Sand
3	San Ardo	Monterey "E" Sand
3	Monroe Swell	Santa Margarita
4	Buena Vista	Tulare
4	Kern Bluff	Vedder
4	Kern River	Vedder*
4	Mountain View	Kern River
4	Pleito	Chanac
4	Pleito	Kern River
4	Poso Creek	Santa Margarita
5	Coalinga	Santa Margarita
5	Coalinga	Etchegoin-Jacalitos
5	Guijarral Hills	Etchegoin-Jacalitos*
5	Helm	Tulare-Kern River
5	Riverdale	Pliocene
5	Turk Anticline	San Joaquin
6	Sutter Buttes Gas	Kione*

* oil and/or gas producing

BUENA VISTA OIL FIELD





CONTOURS ON TOP OF ETCHEGOIN

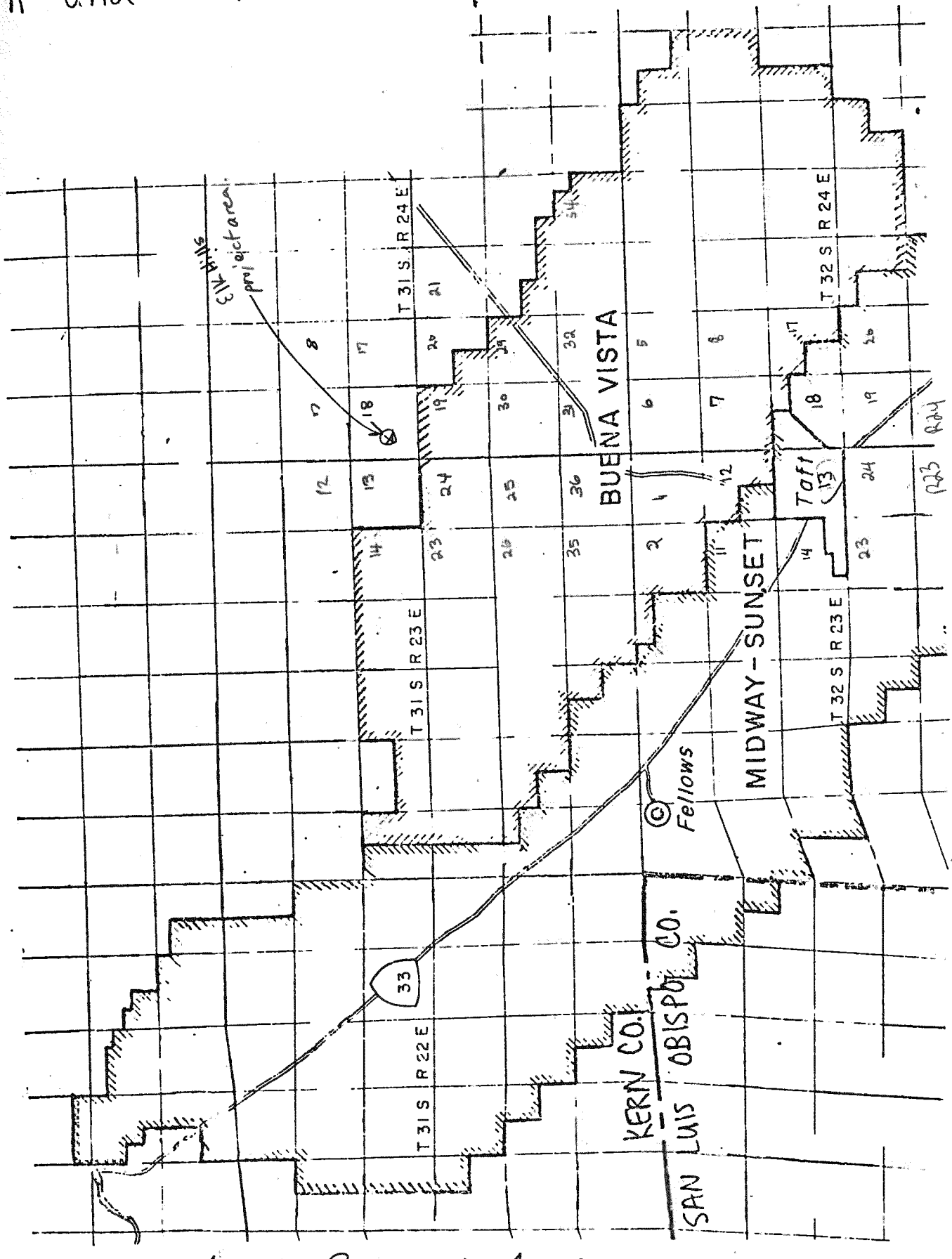
OIL FIELDS

Buena Vista + Midway dunset

Dist 4

Kern and San Luis Obispo Counties

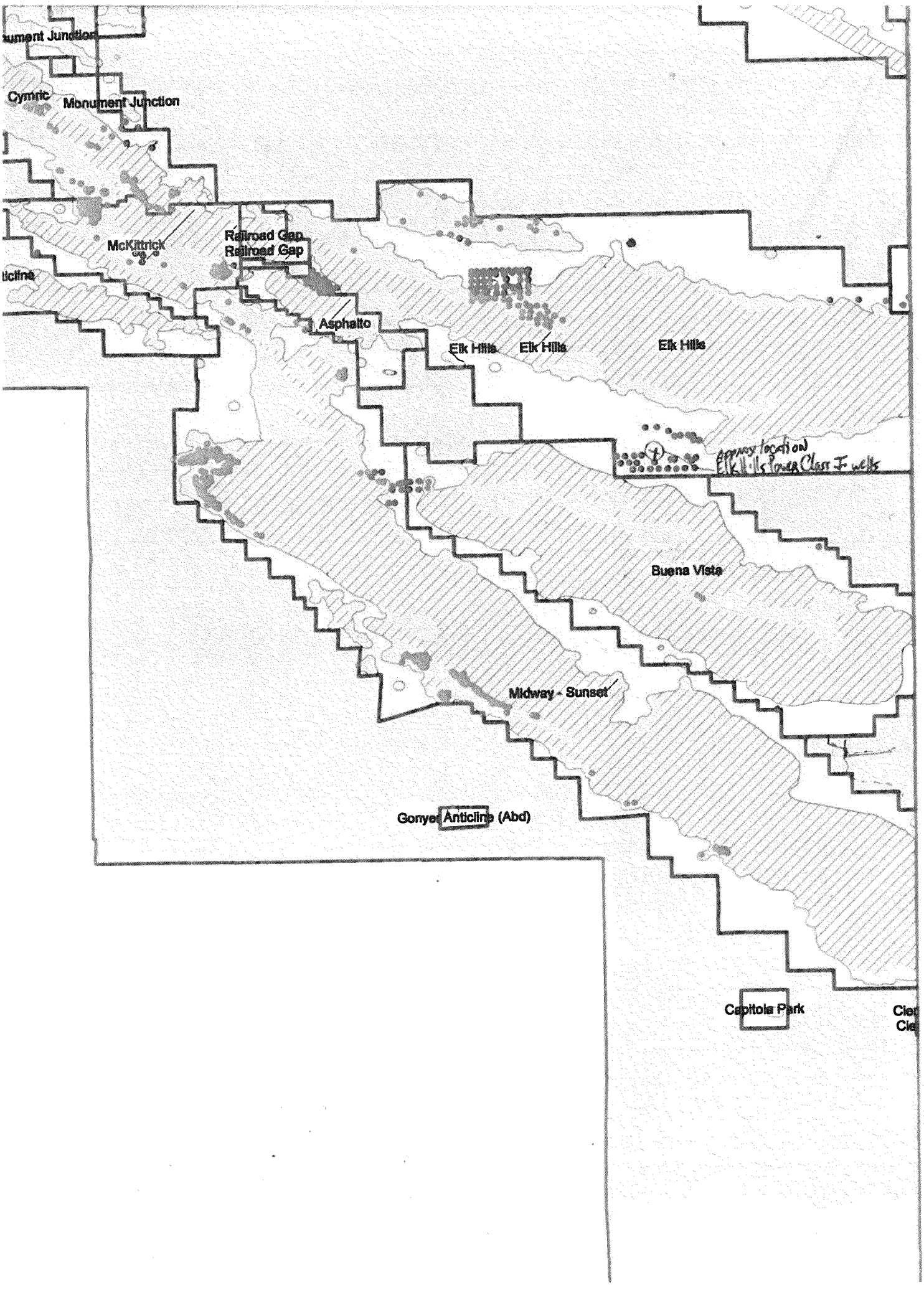
(From Privacy Application)



Appendix B Table 1, Pgs B11-B45

Maps of Lateral Limits of Non-hydrocarbon products Aquifers

B-25


Cymric
Monument Junction
McKittrick
Railroad Gap
Railroad Gap
Asphalto
Elk Hills
Elk Hills
Elk Hills
Buena Vista
Midway - Sunset
Capitola Park

the injection well.

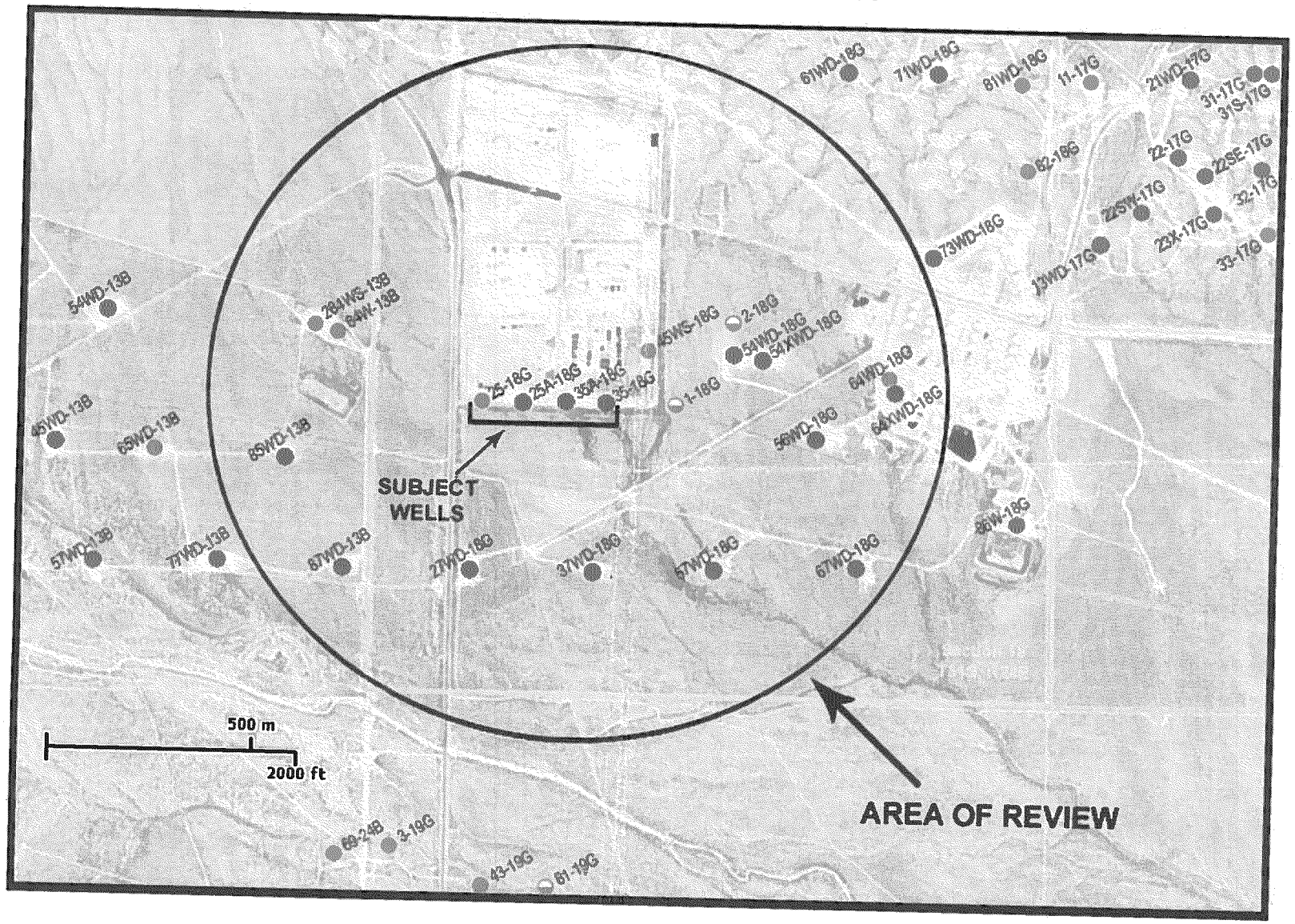
Comment No. 3:
The commenter believes that EPA proposes to alter or modify important permitted well construction requirements after the close of public comment in violation of 40 CFR Part 124.
Response No. 3:
EPA may make minor modifications to permits under 40 CFR §144.41(f) to change construction requirements approved by the EPA Region 9 Director (Director) pursuant to 40 CFR §144.52(a)(1). Major modifications must be processed under the procedures of 40 CFR Part 124 and therefore must be public noticed.

Nonetheless, EPA acknowledges that draft permit condition "II.C.1.a.ii." may be read out of the intended context of minor modification to construction requirements as stipulated in conditions "II.A.3. Injection Intervals" and "II.A.5. Proposed Changes and Workovers." To address this concern, EPA has amended the draft permit condition II.C.a.(ii) to read "The Director may require minor modifications to the construction requirements based upon the information obtained during well drilling and related operations should the proposed casing setting depths not completely cover the base of the USDW." See enclosed copy of the draft permit.

Comment No. 4:
The commenter expressed the concern that the Tulare formation, which is the proposed injection zone, is not an exempt aquifer outside the boundaries of the Elk Hills oilfield and is therefore an USDW. It would be contaminated by off-site migration of injected fluids.
Response No. 4:
The Tulare formation is not an USDW outside of the boundaries of the Elk Hills field at this location because it is an exempted aquifer in the Buena Vista Front area of the Buena Vista oilfield, which directly adjoins the Elk Hills oilfield to the south. In addition, numerous calculations using a variety of waste plume geometries and formation characteristics have demonstrated that even under significantly less favorable conditions, the waste front will not migrate off-site.

Comment No. 5:
There is no discussion on compatibility of injectate with injection zone. The permittee should provide engineering estimates of expected chemical analysis of injectate and should consider concentration levels as compared to drinking water standards.
Response No. 5:
Compatibility of fluids is not expected to become a problem in this case because examination of waste streams from similar operations with similar permitted and geologic settings has shown no

Wells in Area of Review



● ACTIVE INJECTOR ● ACTIVE PRODUCER ● PLUGGED ◒ DRY HOLE

California Division of Oil, Gas, and Geothermal Resources, Online Mapping System, December 2011